The Glass Beads of Ban Bon Noen, Central Thailand

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THE SITE OF BAN BON NOEN in central Thailand was excavated in 1990. It yielded a surprisingly large number of glass beads for a nonmortuary site. Most of the beads were the common Indian trade beads, but a few may have different origins. One distinctive large group of orange-coated, red-core beads is apparently new to the literature. Manufacturing methods and distribution within the site are discussed in this article, and a tentative chronology has been worked out by comparing artifacts that have been imported from nearby sites.[1]

THE ARCHAEOLOGICAL SITE

The site of Ban Bon Noen, Chonburi Province (Fig. 1) is situated 5 km northeast of Phanat Nikhom and approximately 3 km east of the main road to Chachoengsao. Its excavation was a joint project between the Fine Arts Department, Bangkok, and the Anthropology Department of Otago University. Charles Higham and Rachanie Bannanurag were codirectors, and Jacqueline Pilditch was assistant director of the project. An area of 5 × 7 m within the village compound was excavated during January and February 1990 (Fig. 2). Six occupation layers were identified before natural deposits were reached at 1.5 m. The use of the site varied through time, but no burials were recovered. At present radiocarbon dates are not available, but the site can be placed in a general chronological context by comparing the artifacts found there with those recovered from two nearby sites, Khok Phanom Di and Muang Phra Rot (see Fig. 1).

Stone bangles and adzes of types recovered from Khok Phanom Di (Pilditch in press; Pisnupong 1988) were found in the lower levels, and pottery of the Muang Phra Rot style was prevalent in the upper layers (Rachanie Bannanurag, personal communication 1990). The site was therefore occupied from the late premetallic/early metallic era to the early protohistoric period, a time span of perhaps 1000 years. Until further study has been undertaken, it will not be known whether there was any break in the occupation.

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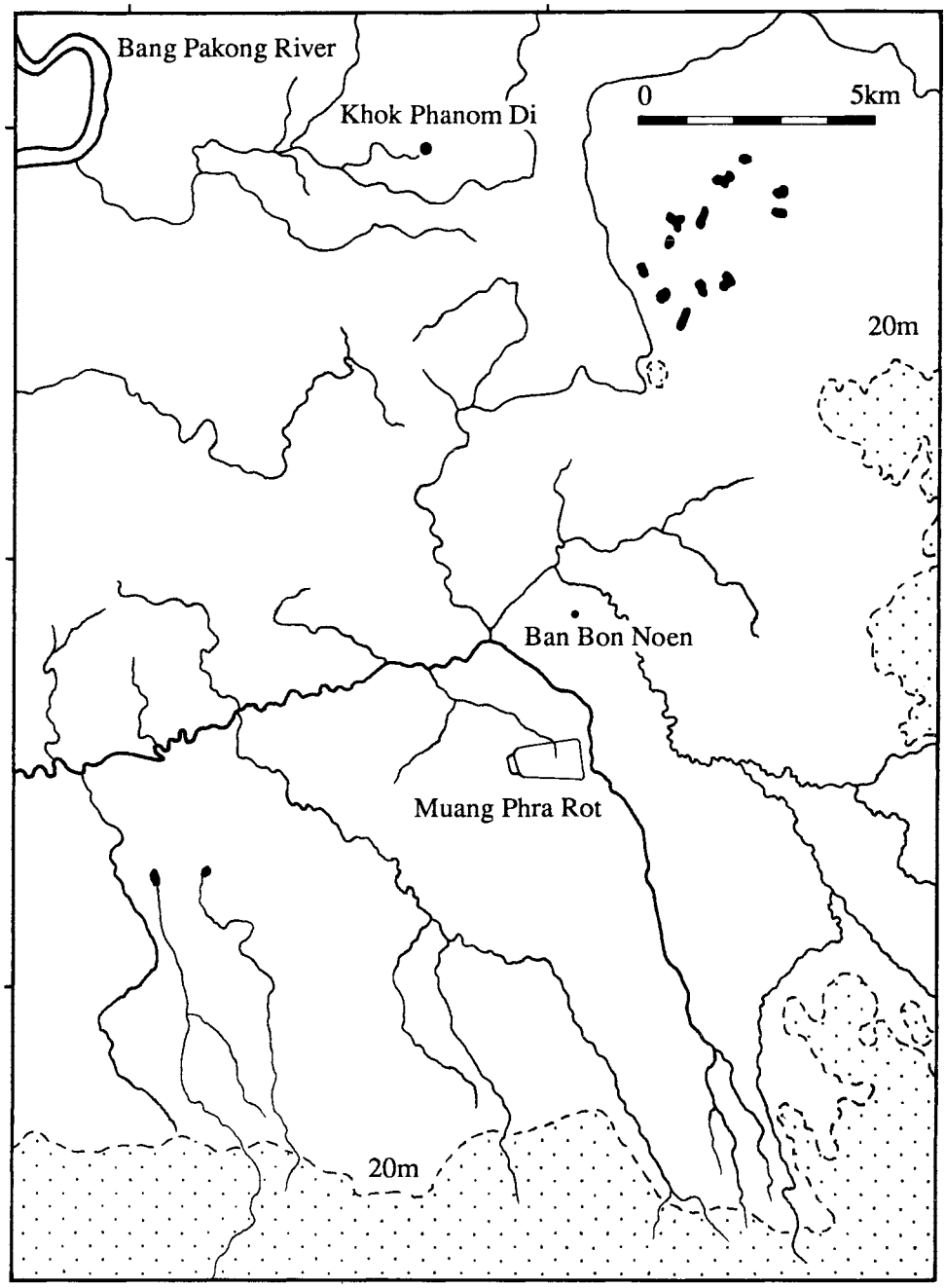

Fig. 1. The geographical location of sites mentioned in the text.

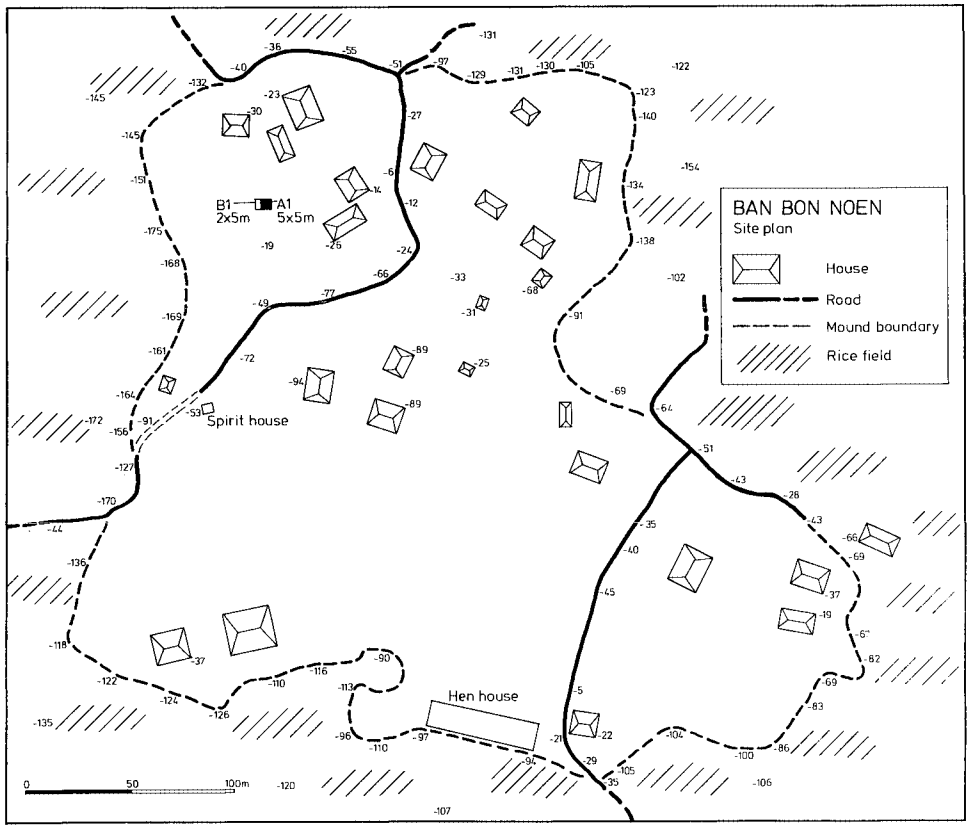

Fig. 2. The village of Ban Bon Noen, showing the excavation site in the northeast corner (upper left).

THE BEADS

By comparison with many other sites, relatively few beads (520) were recovered. Eighty percent of these were small "trade wind" beads (Dubin 1987:184, 347) or IPMDGB (Indo-Pacific Monochrome Drawn Glass Beads; see Francis [1985:44]). They were made from small drawn tubes in a variety of colors including yellow and green. The predominant colors were red, blue, and orange. With few exceptions their lengths ranged from 1.1 mm to 3.5 mm and their diameters from 1.8 mm to 5.0 mm. The blue beads were generally larger than the others and were translucent or even transparent rather than opaque.

Among the other, less common types of beads recovered were two found in the uppermost layer, which were made from a glass that appeared to be dark blue. Magnification showed that it consisted of compressed lumps of glass that were predominantly blue but included area that were clear, brown, or black. Both beads were formed from a drawn tube. One was garrotted at both ends and the other had one end garrotted and one shaped by torsion. The twisting is clearly seen in the trail of air bubbles.

A second group of unusual beads was represented by three comparatively large beads, two of them fragments from layer 2 and one a complete bead from layer 3.

These were of the type called gold-in-glass. One of the fragments was an oblate, with only the outer layer of semitransparent amber yellow glass remaining. The second fragment was from a spherical bead. In this case a portion of the inner layer, which consisted of a creamy white opaque glass, also remained. In neither bead was there any evidence of gold leaf. The complete bead from layer 3 was spherical, and the fold line was still clearly visible. It is a dull translucent yellow with no bright reflections. Examples of gold-in-glass beads are illustrated in Dubin's work (1987: 92).

A third group of unusual beads was recovered: eight collar beads made from either glass (three) or faience (five). Six of the eight beads had rectangular longitudinal sections with transverse grooves set approximately one-quarter of the distance from each edge. The three glass collar beads had all been flattened, giving oblong rather than round transverse sections. All three were fragmentary. The two oldest were recovered from layer 3 pits. They were apparently broken after they had been deposited in the pits, but they originally had rectangular longitudinal sections. The third bead, found in layer 1, had a discoid central portion. As it had one collar missing and the other misshapen, it was probably one of the several rejects found at the site. Of the five faience collar beads in this group, one was a simple oblate while the others had round transverse sections. Varying amounts of glaze remained on them, and although several appeared to the naked eye to be porous white glass, under magnification traces of the blue-green glaze could be seen.

The final group of unusual beads is also the largest: these are of the type called red-core. Approximately 90 of them were narrow, orange, cylindrical beads, rarely more than 3.2 mm in diameter and up to 8.4 mm in length. They all have a core of red glass and are covered by an orange slip. Where breaks in the beads occur, a colorless fritty or vitreous glass can be seen within the red core and occasionally between the core and the slip.

MANUFACTURING TECHNIQUES

Almost all of the beads recovered were made from drawn canes. Most were formed simply by reheating broken pieces of tube. The opaque forms were made from poorly mixed glass, which resulted in different-colored stripes running parallel to the hole. Most of the surfaces of the IPMDGBs are still fairly shiny, and there is little evidence of the solid quartz particles that are still present in the duller *mutisalah* type of glass discussed below. The inference here is that the latter beads were made using lower temperatures. The large majority of the blue beads recovered were translucent and apparently well mixed, as no stripes were present and only occasional trails of air bubbles showed that they had originally been drawn. The bubbles were round, not elongated as would be expected, so either this glass recipe had a lower melting point than the opaque recipes or the reheating process was carried out at a higher temperature. Chemical analysis would clarify this point and perhaps help decide whether this group should be treated differently from the other IPMDGBs.

Many of the red-orange beads have dull surfaces and quartz inclusions. At least two bead authorities distinguish this grouping as *mutisalah* beads (Francis 1991: 224; Lamb 1966: 83), but even in this grouping there is evidence for at least three different methods of manufacture. The differences are great enough to suggest that there was more than one source of manufacture of these beads.

The first group of *mutisalah* beads consists of comparatively large oblates or cylinders with small holes. They were made by drawing up fairly thick-walled tubes, which were then either reheated to round off the ends or occasionally pressed at the ends to smooth them off.

The second group of beads (ground) also have fairly large diameters, but their holes are much larger and several of them appear to have had a second coating of glass. Although the present surface is very rough, modern chips show that the glass was fully vitrified. At Ban Bon Noen these beads come in two main forms: short cylinders (often with one end concave) and oblates. The beads were precisely made. The ends of the cylinders were ground and the sides uniform. It is not clear whether the sides of the cylinders were ground or rolled on a flat surface while still in a tubular form. The act of rolling or marvering may cause the hole to expand; this could be the reason why the cylinders' holes are usually larger than those of the oblates. The sides of the oblates may also be ground.

The third group of *mutisalah* beads is the most unusual. They are all very narrow cylinders with an obvious red core and a thin orange outer coating. At first glance the manufacturing method seems simple. A narrow tube of red glass would be drawn and then dipped in the orange glass before being broken into bead lengths. The ends would then be smoothed to varying degrees. A problem arises, however, when the center of the red core is exposed, either by over-zealous smoothing of the ends or by a modern chip. The red glass itself has an inner core of colorless glass that is more or less vitrified and completely surrounded by the red coloration. This could not have happened before the tube was broken into bead size, yet the orange slip is only on the outer surface, not the ends. The most likely explanation is that the broken beads were reheated in an oxidizing rather than reducing atmosphere, and then the orange slip was added by marvering rather than dipping. As the red core is not a major feature of the bead, it was probably a cost-saving measure. This suggests not only the popularity of the orange color but also the expense or short supply of that type of glass.

DISTRIBUTION WITHIN THE SITE

Six occupation layers were identified at Ban Bon Noen. All the beads except two were found in the upper three layers. Only 58 beads were recovered from layer 1. Most of these were IPMDGBs, with red and blue as the predominant colors. The discoid misshapen collar bead was found in this layer, as were the two large blue beads formed by torsion or garrotting. Four narrow cylinder beads were also recovered. These were of red glass with a clear center and no orange slip. The few other artifacts found in this layer consisted mainly of clay objects, such as net sinkers, spindle whorls, and lids or spouts with onion-shaped domed ends. There were a few unidentifiable fragments of bronze and iron, and one iron tool.

There were four excavation spits in layer 2, all fairly featureless. The number of beads varied from 44 in spit 1 to 124 in spit 4 (Table 1). One faience bead and two fragmentary gold-in-glass beads were found in spit 3. The ground *mutisalah* beads were recovered from all but spit 2. Other artifacts found in layer 2, spit 1 consisted of metal fragments and the clay net sinkers, spouts, and pellets that were found throughout the site. Layer 2, spit 2 also had a bronze bell loop and earring, and a tin ring and earlobe plug. A clay artifact similar to a pottery anvil but with a central

TABLE 1. DISTRIBUTION OF GLASS BEADS IN LAYER 2

	SPIT				
TYPE	1	2	3	4	TOTAL
Red-core *mutisalah*	8	12	8	26	54
Ground *mutisalah*	2	0	1	4	7
Faience collar	0	0	1	0	1
Glass collar	0	0	0	0	0
Gold-in-glass	0	0	2	0	2
IP green	6	7	4	8	25
IP red	13	22	22	48	105
IP blue	11	16	14	21	62
IP orange	3	3	3	14	23
IP yellow	0	5	2	3	10
IP black	1	2	0	0	3
Total	44	67	57	124	29

TABLE 2. DISTRIBUTION OF GLASS BEADS IN LAYER 3

	SPIT				
TYPE	1	2	3	PIT	TOTAL
Red-core *mutisalah*	24	1	3	3	31
Ground *mutisalah*	4	2	1	0	7
Faience collar	1	2	0	1	4
Glass collar	0	0	0	2	2
Gold-in-glass	1	0	0	0	1
IP green	10	1	3	3	17
IP red	24	5	10	4	43
IP blue	25	2	4	1	32
IP orange	4	0	3	2	9
IP yellow	7	0	2	1	10
IP black	4	0	0	0	4
Total	104	13	26	17	160

perforation was also found. Spit 3 had another tin earlobe plug and other tin artifacts, as well as fragments of false filigree bells. Spit 4 not only had the largest number of beads, it also had the greatest variety of other artifacts. Tin and bronze artifacts similar to those found in spit 3 were recovered, as were an iron chisel, a fragment of a gold ornament, and stone adzes.

Layer 3 at Ban Bon Noen, unlike layer 2, contained a large number of pits and surface features. Despite this, a large number of beads were recovered from the layer, especially from spit 1 where there were four times the number found in any of the other spits (Table 2). To some extent this may be accounted for as a case of beads being dropped during the overlying occupation and being displaced downwards into the lower layer, although approximately 25 percent of them were from one of the features. This raises the possibility that beads such as the gold-in-glass beads should be placed in a later time frame.

The beads in spit 1, which included one faience collar and one gold-in-glass, were associated with bronze and iron fragments, an iron tool, and bronze bangles and rings. Half of a tin earring and an earlobe plug were found, as well as a fragment of stone bangle. Only one of the 13 beads recovered from spit 2 was found in a feature. Except for two faience collar beads, all were either IPMDGBs or red-core beads with red the predominant color. They were associated with a variety of other artifacts, including fragmentary stone, clay, tin, and bronze bangles. There were also iron fragments, a stone axe, and a clay anvil. None of the spit 3 beads came from features, and there were no unusual types among them. The associated artifacts were few—an iron tool, burnishing stones, and a bronze fragment. The final group of beads from layer 3 was found within a deep pit that extended to the base of the site. In all, 17 beads were recovered from this pit, including two rectangular glass collar beads and one faience collar bead.

Two small green IPMDGBs and a fragment of iron were recovered from layer 5, spit 2. Radiocarbon dates will have to be obtained to establish whether these artifacts are anomalies or evidence for very early iron at the site.

CHRONOLOGICAL DISTRIBUTION

The three lower layers at Ban Bon Noen are matched very closely with the upper layers of Khok Phanom Di, 18 km to the north (Fig. 1). The style of the stone tools is the same, and examples of the stone disc rings manufactured at Khok Phanom Di were found at Ban Bon Noen. The dating of the upper layers of Khok Phanom Di is not established, although they postdate the 1500 B.C. dates of the lower mortuary layers (Higham and Bannanurag 1990). The undated layers reach a depth of 1.5 m and contain artifacts that are stylistically similar to material found at the early Iron Age site of Khok Phlap (which despite the types of artifacts found contained no iron; see Daeng-iet [1978]) and at Ban Kao (Sørenson and Hatting 1967). Given that the Southeast Asian iron technology originated from India (Bronson 1990) and that the range of dates for the iron found at Ban Kao is 800–500 B.C. (Sørenson 1973), it seems reasonable to assign similar dates to the upper layers at Khok Phanom Di—and therefore also to the nonmetallic layers of Ban Bon Noen.

By 500 B.C. iron was reasonably widespread throughout Thailand. The close association between glass beads and iron is well recognized, and therefore layer 3 may date from as early as 500 B.C. The presence of iron in layer 3, spit 1 and in all of layer 2 indicates a possible range of dates of 200 B.C. to A.D. 600. Layer 1 has few nonglass artifacts in it that can be used to establish chronology. From the evidence at the site it would seem that the glass-bearing layers may be dated to a period between 500 B.C. and A.D. 700. By studying the beads themselves, it is possible to narrow this range a little.

BEAD SOURCES AND DATES

Francis (1982) suggests that the IPMDGBs originated at Arikamedu on the southeast coast of India, during the last two centuries B.C. The site of Ban Don Ta Phet in west-central Thailand, however, contains a large number of these beads and is consistently dated to the fourth century B.C. (Glover 1990). This suggests either that

Arikamedu could have been manufacturing and exporting beads from the fourth century B.C. or that there was an earlier site of manufacture of these beads that has yet to be identified. The date of the lowest spit in layer 3 could therefore have a range of 400–200 B.C. The presence of the Iron Age bronzes and tin ornaments in the upper part of layer 3 supports this interpretation. The upper spit of layer 2, however, needs some consideration.

More than 80 percent of the beads at Ban Bon Noen are IPMDGB or *mutisalah* types. They do not vary significantly throughout the bead-bearing layers, so there is no reason to postulate changes in the sources of the beads through time. By the fifth century A.D., manufacturing sites of beads and tin ornaments were functioning on the Thai/Malaysian peninsula (Bronson 1990). They produced beads of the same types as those from Arikamedu and other Indian bead centers. The locally made beads were presumably cheaper than the Indian originals and their production would thus affect the number of imports. This could well be reflected in the smaller number of beads found in layer 1 at Ban Bon Noen. This suggests a date of C. A.D.

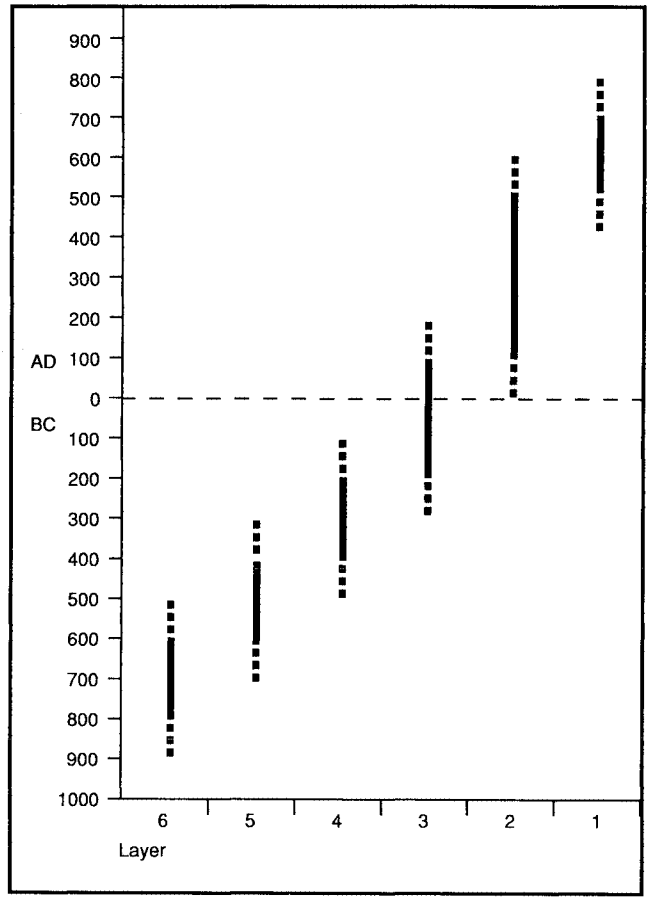

Fig. 3. The tentative dating for Ban Bon Noen.

500 for layer 1 and a range for layer 2 of 200 B.C.–A.D. 500. The tentative dating of the site is set out in Figure 3.

Establishing a chronology for Ban Bon Noen does not help identify the sources of most of the unusual beads. Nothing appears to have been published concerning the red-core beads that are so prominent at Ban Bon Noen. Likewise, the type of glaze on the faience beads cannot be matched with published examples, although similarities may be noted with beads of Iranian and Indus Valley origin (Dubin 1987: 57). The gold-in-glass beads were popular over a long period in the Near East. They were initially made during Roman times in places such as Syria and Egypt. By A.D. 700 they were being copied by the Islamic bead makers. The Roman beads were being imported into India in the first two centuries A.D., and the rare examples found at Arikamedu may well have come from Egypt (Dubin 1987:194, 195). The amygdaloid glass collar beads with the rectangular longitudinal section were not found at Oc Eo, Viet Nam, but the later collar bead with the discoid center and the dark blue beads formed by torsion were present there (Malleret 1962). They do not appear to feature among the known Indian beads during this period, and as yet there is no evidence of monochromatic Chinese beads in Southeast Asia at this time (Pilditch 1986).

DISCUSSION

Although the number of beads recovered from Ban Bon Noen is small by comparison with finds from other sites, the facts that it is a nonmortuary site and that the excavation was relatively small (35m^2) make the quantity of beads significant. There was comparatively little variety in the beads recovered from Ban Bon Noen. With the exception of the red-core beads and the rectangular collar beads, they were all represented at Oc Eo and most were also found at Ban Don Ta Phet (Glover and Alvey 1985). At both these sites, however, the Ban Bon Noen types were only a small proportion of those present. The square, rectangular, biconal, and polyhedral beads and other more complex forms present at Oc Eo and Ban Don Ta Phet were not found at Ban Bon Noen.

Why would contemporary sites to the east and west of Ban Bon Noen have a greater variety of beads? It is possible that Ban Bon Noen was a bead-manufacturing site. At a manufacturing site, only a limited number of types of beads would be produced. Raw glass and malformed beads in the upper layers at Ban Bon Noen could support this hypothesis. The main problem with it, as mentioned above, is that there is no evidence for changes in the manufacturing sources of the beads through time. For Ban Bon Noen to be considered a manufacturing site, it would also have to be credited with the production of beads at about the same time as Arikamedu and long before any other recognized manufacturing sites in Southeast Asia, such as Khuan Lukpad (Bronson 1990).

A more likely explanation is that Ban Bon Noen was a bead emporium or market. The limited variety of beads found could be due to availability from traders or to local preferences. The beads may have been traded by weight or volume, which would make the odd piece of raw glass or malformed bead not unexpected. Glass, stone, and metal jewelry (bangles, ear ornaments, and stone beads) were found in

association with the glass beads. The presence of these other types of ornaments further supports the market hypothesis.

CONCLUSION

Sometime after 400 B.C. Ban Bon Noen became a place where imported glass beads and other ornaments were traded. The varieties were limited but apparently popular enough for the market to survive for 700 years. Its decline may have been due to local Southeast Asian production of beads, which were cheaper than the imported originals. Further study of other aspects of the site may suggest another reason for its decline. Although Ban Bon Noen is unlikely to prove to be an early manufacturing site, it is possibly one of the earliest localities where glass beads were traded in Thailand.

NOTES

1. The research reported here was to have been part of Jacqueline Pilditch's doctoral dissertation at the University of Otago, New Zealand, but her untimely death has led to its posthumous publication as an independent paper. The first draft of the paper was written by Pilditch, and at her request the draft was edited and submitted for publication by Jefley Aitken, Dianne Hall, Carolyn Quinn, and Nancy Tayles of the Department of Anthropology, University of Otago.

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ABSTRACT

Recent excavations at the site of Ban Bon Noen in central Thailand produced glass beads from cultural deposits dated between 400 B.C. and A.D. 700. Most of the beads at the site fall into the category known as *mutisalah* and probably originated in India. Their relatively dense occurrence at Ban Bon Noen in nonmortuary contexts suggests that the site may have functioned as a node in a trade network linking Southeast Asia to India during the Iron Age. KEYWORDS: Prehistoric glass beads, Thailand archaeology, prehistoric trade.